

SURREBUTTAL TESTIMONY
OF
BRIAN HORII
ON BEHALF OF
THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF
DOCKET NO. 2019-184-E
IN RE: SOUTH CAROLINA ENERGY FREEDOM ACT (H.3659)
PROCEEDING TO ESTABLISH DOMINION ENERGY SOUTH CAROLINA,
INCORPORATED’S STANDARD OFFER, AVOIDED COST
METHODOLOGIES, FORM CONTRACT POWER PURCHASE
AGREEMENTS, COMMITMENT TO SELL FORMS, AND ANY OTHER
TERMS OR CONDITIONS NECESSARY (INCLUDES SMALL POWER
PRODUCERS AS DEFINED IN 16 UNITED STATES CODE 796, AS
AMENDED) – S.C. CODE ANN. SECTION 58-41-20(A)

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.

A. My name is Brian Horii. My business address is 44 Montgomery Street, San Francisco, California 94104. I am a Senior Partner with Energy and Environmental Economics, Inc. (“E3”). Founded in 1989, E3 is an energy consulting firm with expertise in helping utilities, regulators, policy makers, developers, and investors make the best strategic decisions possible as they implement new public policies, respond to technological advances, and address customers’ shifting expectations.

1 **Q. DID YOU FILE DIRECT TESTIMONY AND AN EXHIBIT RELATED TO THIS**
2 **PROCEEDING?**

3 **A.** Yes. I filed direct testimony and an exhibit with the Public Service Commission of
4 South Carolina (“Commission”) on September 23, 2019.

5 **Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?**

6 **A.** My surrebuttal testimony addresses the rebuttal testimony of Dominion Energy
7 South Carolina, Inc.’s (“DESC” or the “Company”) witnesses James W. Neely, Joseph M.
8 Lynch, Matthew W. Tanner, Eric H. Bell, Daniel F. Kassis, and Thomas E. Hanzlik. I also
9 address the amended direct testimony of James W. Neely. Due to the overlapping rebuttal
10 testimony of several DESC witnesses, my surrebuttal testimony is organized by topic areas.

11
12 **I. AVOIDED ENERGY COSTS**

13 **Q. DO YOU AGREE WITH THE COMPANY’S ASSERTION THAT MAINTAINING**
14 **AN ADDITIONAL 35% OF INSTALLED SOLAR CAPACITY TO**
15 **ACCOMMODATE THE INTEGRATION OF SOLAR RESOURCES BASED ON 1-**
16 **HOUR DROPS IS BETTER THAN USING 15- MINUTE DROPS (NEELY**
17 **REBUTTAL, PP. 5-6)?**

18 **A.** No. Consider a one (1) hour period to be a series of four (4) 15-minute periods. If
19 there is a drop in expected solar output in the first 15-minute period, the operator would
20 rely on existing operating reserves to replace the reduced solar output. At the same time,
21 the operator could, if needed, call upon other off-line resources to stand by to inject power
22 in the remaining 15-minute periods which would restore the desired operating reserve level
23 within the hour. Based on DESC’s analysis of solar drops over 15-minute periods, DESC

would only need to carry 13% to 18% of solar capacity for additional operating reserves. DESC could then add to reserves as needed, rather than carrying an additional 35% of installed solar capacity as additional operating reserves at all hours when solar generates. DESC's actual costs would be lower if these additional reserves were added as needed, rather than over-scheduled, as would occur using the Company's 35% installed solar capacity assumption.

Q. DO YOU AGREE WITH COMPANY WITNESS BELL, AND OTHER DESC WITNESSES, THAT OVER A FOUR (4) HOUR PERIOD SOLAR CAN DROP BY 62% OF THE INSTALLED CAPACITY AND THIS CHARACTERIZATION IS "AN IMPORTANT GAUGE OF RELIABILITY RISK" (BELL REBUTTAL, P. 3)?

A. No. The 62% "drop" is irrelevant for determining the amount of additional operating reserves that should be added for solar and should be rejected.

First, the 4-hour period is inconsistent with the intended purpose of operating reserves. Operating reserves are carried to address short-term changes in demand or generation. Changes over four (4) hours can be addressed with options that are less costly, such as generation unit rescheduling and the starting of off-line resources.

Second, the Company characterizes the drop as being "unpredicted." However, in DESC's discovery response to ORS Audit Information Request 2-6, the Company provides no data to support that the drop is the difference between expected and actual output. Rather, the Company's response indicates the drop is simply the reduction in solar generation. If most of the solar reduction could have been predicted (for example, through day ahead forecasts based on expected weather patterns), there would be a much smaller

“unpredicted” drop to be addressed through the carrying of additional reserves. In that case, DESC’s estimates of the risk of unexpected solar drops are overstated.

Q. DO YOU AGREE WITH THE COMPANY’S USE OF THE AMENDED ADDITIONAL OPERATING RESERVE COSTS TO UPDATE THE PROPOSED AVOIDED ENERGY RATES (NEELY AMENDED DIRECT, PP. 7-8; NEELY REBUTTAL, P. 7).

A. No. The Company filed amended direct testimony on September 20, 2019, which updated operating reserve costs. I was not able to address the Company’s amended testimony in my direct testimony. The Company’s amended operating reserve costs start at \$3.26 per megawatt hour (“MWh”), immediately rise to \$7.57/MWh, and average above \$8.50/MWh for the ten (10) year period of 2020-2029. The high magnitude of the operating reserve costs, both in absolute and in relative terms compared to the Company’s original direct testimony, immediately draw into question the appropriateness of DESC’s assumptions, such as additional operating reserves equal to 35% of installed solar capacity. The large change in estimated additional costs for solar integration between DESC’s direct and amended direct testimonies also raise questions as to whether DESC’s production simulation modeling of avoided energy costs is appropriately reflecting the impact of solar integration. I do not believe DESC provided sufficient support to justify the adoption of the avoided energy rates that include the Company’s amended estimation of the costs of the additional operating reserves. Therefore, the Commission should reject the amended proposed avoided energy rates for solar QFs.

Q. DO YOU AGREE WITH THE COMPANY’S ASSESSMENT THAT THERE IS A “SIGNIFICANT RISK OF OVERLAP OF SOLAR DROPS AND

**BASELOAD/INTERMEDIATE GENERATOR OUTAGES” ASSUMING A 32%
PROBABILITY OF SUCH AN OUTAGE IN A YEAR AND SOLAR GENERATING
MORE THAN 50% OF THE HOURS IN A YEAR (BELL REBUTTAL, P.4)?**

A. No. While there is overlap risk, I believe that Company witness Bell’s presentation obscures how small the risk actually is.

First, the 32% outage probability risk is over the entire year. If the assumption is a uniform risk for every day of the year, the daily risk of a unit being forced out is only 0.088% (32%/365 days). Second, if you accept the assumption that solar is generating 50% of the hours of the year, and assuming outage risk is constant over the day, the risk there is a generator outage when solar is operating is only 0.044% (0.088% * 50%). Third, if you analyze the data from Duke Energy Carolinas, LLC’s (“DEC”) and Duke Energy Progress, LLC’s (“DEP”) testimony filed in Docket Nos. 2019-185-E and 2019-186-E regarding the variations between forecast and actual solar output in their respective service territories, DEC and DEP indicate solar output was below forecast levels by 10% or more only 0.037% of the time for DEC and 0.007% of the time for DEP.¹ Therefore, if there is an assumed 0.05% risk of a large drop in solar output for DESC, the combined probability of an outage when solar is operating and when there is a large drop in solar output is only 0.00002% (0.044% * 0.05%). I do not consider 0.00002%, or a less than 1 in 4.5 million risk to be significant.

I used the DEC and DEP information in my example because DESC’s analysis of solar drops improperly calculates drops relative to forecast levels of solar output. Nevertheless, if I were to use DESC’s data and accept DESC’s recommendation of

¹ Docket Nos. 2019-185-E and 2019-186-E, Wintermantel Direct, Exhibit 2, Tables 11 and 15.

covering 96% of the 1-hour drops, the uncovered risk is only 4% (100% - 96%) and the combined risk is only 0.0018% (0.044% * 4%), or less than two thousandths of 1% percent, which remains insignificant.

Q. DO YOU AGREE WITH THE COMPANY'S CLAIM THAT SINCE DESC SYSTEM CONTROL CONSIDERS 40% OF FORECASTED SOLAR ACROSS THE PEAK HOUR TO BE AT RISK, THAT A 35% MODELING ASSUMPTION FOR AVOIDED ENERGY COSTS IS JUSTIFIED (HANZLIK REBUTTAL, P. 21)?

A. No. Again, DESC is overly conservative in setting operating reserve requirements for addressing solar generation. The Company's testimony suggests that only solar output variability is considered, and there is no economic balancing of risks and costs in establishing reserve requirements. There is little reason for DESC to try to minimize those costs. Since DESC intends to collect the costs from solar developers, this removes the normal pressure to minimize customer rates that helps constrain utility costs.

Q. PLEASE EXPLAIN YOUR RECOMMENDATIONS FOR AVOIDED ENERGY RATES FOR STANDARD OFFER SOLAR QFS.

A. I recommend that the Commission approve the avoided energy rates shown below in Tables 1 and 2, that reflect DESC's estimated solar avoided energy costs without additional operating reserves,² but inclusive of the recommended variable integration cost ("VIC") from my direct testimony. Thus, the avoided energy costs I propose do not depend upon DESC's flawed 35% additional operating reserve assumption yet recognize potential costs of solar integration via my adjustments to DESC's overly risk averse VIC value. I

² Response to ORS Utility Services Request #1: "Avoided Costs – wo Additional Reserves.xlsx"

also made adjustments for associated line losses, working capital impacts, gross receipts taxes, and generation taxes.³

DESC has pointed out that VIC is meant to represent integration costs associated with existing solar, while the Company's avoided energy rates were meant to reflect the incremental integration costs for future solar. There is an "existing versus incremental solar" mismatch in using the adjusted VIC values for the avoided energy rates for future solar. However, I believe that my recommended values are a reasonable indication of current solar integration costs, and a superior option to using the faulty integration costs embedded in DESC's proposed avoided energy rates.

Table 1: Rate PR-1 Avoided Energy Rates for Solar QFs (\$/kWh)

Time Period	DESC Amended Proposed	E3 Proposed
May 2019-April 2020	.02763	.03114

Table 2: Rate PR-Standard Offer Avoided Energy Rates for Solar QFs (\$/kWh)

Time Period	DESC Amended Proposed	E3 Proposed
2020-2024	.01676	.02112
2025-2029	.01566	.02375

Q. ARE THE COMPANY'S AMENDED AVOIDED ENERGY AND CAPACITY RATES FOR SOLAR WITH STORAGE PROJECTS REASONABLE (NEELY AMENDED DIRECT, P. 17)?

³ Response from ORS Utility Services Request #1: "Avoided Costs – Standard Offer.xlsx"

1 when requested, the frequency is irrelevant. One might argue that if capacity is only needed
2 for one (1) month, capacity may cost less than if needed for five (5) months. However, if
3 that one (1) month is the same month that the seller also needs capacity, then the sales price
4 would likely reflect no discount.

5 Similarly, a savvy customer would wait for interruption payments that are close to
6 the utility's cost to otherwise procure that capacity. And indeed, it is common ratemaking
7 practice to set the discount offered to non-firm customers based on the avoided cost of
8 capacity, not the other way around.

9 Although there may have been recent capacity surpluses by neighboring entities
10 that allow for some low-cost purchases, I do not believe this should be the basis for
11 calculating avoided capacity costs. If the Commission were to approve avoided costs that
12 included such market or bilateral deals for capacity, then a market value for summer
13 capacity sales opportunities by DESC would also need to be recognized for the sake of
14 consistency. Either avoided capacity costs are based primarily on the cost of a new CT and
15 DESC's 21% reserve margin, or avoided capacity cost is based on capacity purchases at
16 market prices net of potential capacity sales by DESC at times that differ from DESC's
17 times of capacity need.

18 **Q. DO YOU AGREE THAT THE COMPANY'S USE OF A 60-YEAR ECONOMIC**
19 **LIFE FOR A CT DUE TO THE "SCE&G 2014 DEPRECIATION STUDY" THAT**
20 **DETAILS A LIFE SPAN BETWEEN SIXTY (60) AND SEVENTY-FIVE (75)**
21 **YEARS IS APPROPRIATE FOR CALCULATING AVOIDED CAPACITY COSTS**
22 **(NEELY REBUTTAL, P. 12)**

1 **A.** No. While CT lives can be extended far beyond their original expected lives, such
2 an extension would require expensive plant overhauls. DESC's avoided cost model did not
3 include major overhaul costs. Had major overhaul costs been included, a 60-year economic
4 life could have been used, however the resulting avoided capacity costs would likely be
5 similar in magnitude to the estimates produced using a 20-year economic life without major
6 overhaul costs.

7 **Q. PLEASE ADDRESS THE COMPANY'S CLAIM THAT BECAUSE A**
8 **CONVOLUTION FORMULA WAS USED TO ESTIMATE THE PROBABILITY**
9 **OF SUPPLY EXCEEDING DEMAND IN WINTER, THE DESC APPROACH TO**
10 **EVALUATING THE NEED FOR CAPACITY IS NOT SIMPLISTIC (LYNCH**
11 **REBUTTAL, PP. 3-5).**

12 **A.** The calculation performed with the Convolution Formula does not appear to be the
13 driver of DESC's valuation of capacity. For example, DESC's determination of reserve
14 margins performs a simple addition of independent supply risk and demand risk (Lynch
15 Direct, Exhibit No.__(JML-3), p. 12). Therefore, I maintain the position that DESC's
16 approach for avoided capacity cost is simplistic. This simplistic focus is reinforced by the
17 Company's own rebuttal testimony that attacks the industry standard Effective Load
18 Carrying Capacity ("ELCC") approach because the ELCC recognizes there is a value from
19 solar capacity at times other than before sunrise (Lynch Rebuttal, pp. 4-5). While DESC's
20 system may often peak before sunrise, the need for capacity also depends on the risk of
21 generation or transmission outages, which can occur at other times of the day, therefore
22 resulting in values for capacity at other times of the day.

III. VARIABLE INTEGRATION COSTS

Q. PLEASE ADDRESS THE COMPANY’S STATEMENT THAT “THE RESERVE REQUIREMENT MODELING OF THE ENTIRE DAY IS AN ASPECT OF MODELING THAT DOES NOT CONSERVATIVELY BIAS THE RESULTS BECAUSE THE MAKE-UP OF THE DESC SYSTEM IS SUCH THAT LARGE NUMBERS OF RESERVES ARE ALWAYS AVAILABLE OVERNIGHT” (TANNER REBUTTAL, P. 2).

A. In my direct testimony, I express concern over holding the higher reserves “in the evening or early morning” (Horii Direct, p. 23). Those are times when system loads can be high and solar output low. Since the solar output expected in the evening or early morning hours would be lower than at midday, there would be much lower downward output risk during those hours than during the middle of the day. Therefore, a higher level of extra daytime operating reserves would potentially overestimate the costs that would actually be needed to maintain system reliability during those hours.

Q. DOES THE COMPANY’S USE OF A THRESHOLD OF “ROUNDING TO 1%” INSTEAD OF THE ABSOLUTE MAXIMUM IN POTENTIAL SOLAR UNDER-GENERATION CHANGE YOUR RECOMMENDATIONS (TANNER, REBUTTAL, P. 3)?

A. No. The Company’s Integration Study (“Study”) conducted by Navigant did not conduct an analysis to determine if the 1% value was appropriate. My recommendation is based on moving from the 1% value to a 2% value, so the specific values I recommend are unaffected by the clarification.

Q. IS IT RELEVANT THAT DESC USES AN HOUR-BY-HOUR SOLAR FORECAST FOR DAILY GENERATION PLANNING TO JUSTIFY THAT OPERATING RESERVES ARE NOT OVERSTATED FOR SOLAR INTEGRATION (BELL REBUTTAL, P. 2)?

A. No. My concern is with the way the VIC was calculated in the Study. The Study does not use increased operating reserves that vary during the day. I would expect that DESC uses hourly forecasts for its operations and daily planning, but that fact does not correct the fault in the Study.

IV. VALUE OF DISTRIBUTED ENERGY RESOURCES (“DER”)

Q. GIVEN YOUR ADJUSTMENTS TO DESC’S PROPOSED AVOIDED ENERGY COST RATES FOR SOLAR QF’S, WHAT DO YOU RECOMMEND FOR THE TOTAL VALUE OF DER?

A. I recommend the Total Value of DER as shown below in Tables 3 and 4, that reflect my adjusted avoided energy cost values for solar resources. As discussed above, my recommended avoided energy cost values reflect solar integration costs via the subtraction of my calculated VIC costs. The total value also includes the avoided capacity cost values I presented in my direct testimony.

Table 3: 10-year Levelized Value of DER (\$/kWh): 2019 Proposed (Neely Amended Direct, p. 22) and E3 Recommended

	DESC 2019 IRP Planning Horizon (10-year Levelized)	E3 Recommended (10-year Levelized)	Components
1	\$0.01523	\$0.02111	Avoided Energy Costs
2	\$0.00000	\$0.00379	Avoided Capacity Costs
3	\$0.00000	\$0.00000	Ancillary Services
4	\$0.00000	\$0.00000	T&D Capacity
5	\$0.00003	\$0.00003	Avoided Criteria Pollutants
6	\$0.00000	\$0.00000	Avoided CO ₂ Emission Cost
7	\$0.00000	\$0.00000	Fuel Hedge
8	\$0.00000	\$0.00000	Utility Integration & Interconnection Costs
9	\$0.00000	\$0.00000	Utility Administration Costs
10	\$0.00105	\$0.00105	Environmental Costs
11	\$0.01631	\$0.02598	Subtotal
12	\$0.00133	\$0.00189	Line Losses @ 0.9245
13	\$0.01764	\$0.02787	Total Value of DER

Table 4: Current Period Value of DER (\$/kWh): 2019 Proposed (Neely Amended Direct, pp. 22) and E3 Recommended

	DESC 2019 (Current Period)	E3 Recommended (Current Period)	Components
1	\$0.02671	\$0.03022	Avoided Energy Costs
2	\$0.00000	\$0.00000	Avoided Capacity Costs
3	\$0.00000	\$0.00000	Ancillary Services
4	\$0.00000	\$0.00000	T&D Capacity
5	\$0.00003	\$0.00003	Avoided Criteria Pollutants
6	\$0.00000	\$0.00000	Avoided CO ₂ Emission Cost
7	\$0.00000	\$0.00000	Fuel Hedge
8	\$0.00000	\$0.00000	Utility Integration & Interconnection Costs
9	\$0.00000	\$0.00000	Utility Administration Costs
10	\$0.00089	\$0.00089	Environmental Costs
11	\$0.02763	\$0.03114	Subtotal
12	\$0.00226	\$0.00235	Line Losses @ 0.9245
13	\$0.02989	\$0.03349	Total Value of DER

**V. FORM CONTRACT POWER PURCHASE AGREEMENT (“PPA”) AND NOTICE
OF COMMITMENT TO SELL FORM**

**Q. DO YOU AGREE WITH THE ADJUSTMENTS MADE BY THE COMPANY TO
THE FORM CONTRACT PPAS AND NOTICE OF COMMITMENT TO SELL
FORM, BASED ON THE RECOMMENDATIONS IN YOUR DIRECT
TESTIMONY (KASSIS REBUTTAL, PP. 4-6)?**

1 A. Yes.

2 **VI. SUMMARY OF RECOMMENDATIONS**

3 **Q. HAVE YOUR RECOMMENDATIONS MADE IN YOUR DIRECT TESTIMONY**
4 **CHANGED?**

5 A. Yes. I recommend the following adjustments:

6 1. Reject DESC's avoided energy rates for solar QFs and approve the rates reflected
7 in my surrebuttal testimony;

8 2. Direct that any avoided cost rates for solar with storage reflect both the capacity
9 and integration cost benefits;

10 3. Approve my recommended Total Value of DER;

11 4. Approve DESC's revised Form PPAs and NOC Form; and

12 5. Approve all other previous recommendations stated in my direct testimony.

13 **Q. WILL YOU UPDATE YOUR TESTIMONY BASED ON INFORMATION THAT**
14 **BECOMES AVAILABLE?**

15 A. Yes. ORS fully reserves the right to revise its recommendations via supplemental
16 testimony should new information not previously provided by the Company, or other
17 sources, become available.

18 **Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?**

19 A. Yes.